the homebuilders guide to

EFFECTIVE SEWAGE DISPOSAL

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YEOMANS Brothers Company
1999 N. RUBY ST. • MELROSE PARK, ILL.

Plantation Sub-Division, Louisville, Kentucky, Bollinger-Martin, Inc., Builders. A Yeomans equipped sewage treatment plant serves this planned community of 215 homes.

the NEED
for effective sewage disposal

Today home builders are more conscious than ever before of the need for effective sewage disposal. Responsible builders are doing all they can to prevent the pollution of our streams, lakes and rivers.

Careless sewage disposal practices result in the contamination of our waterways. When a body of water is contaminated, it becomes a nuisance to the community instead of the prime asset which it should be. Diseases are a constant threat along polluted waterways. The recreation value of a lake or stream is lost . . . fish and wildlife are killed . . . boating and bathing become impossible. Property values fall rapidly.

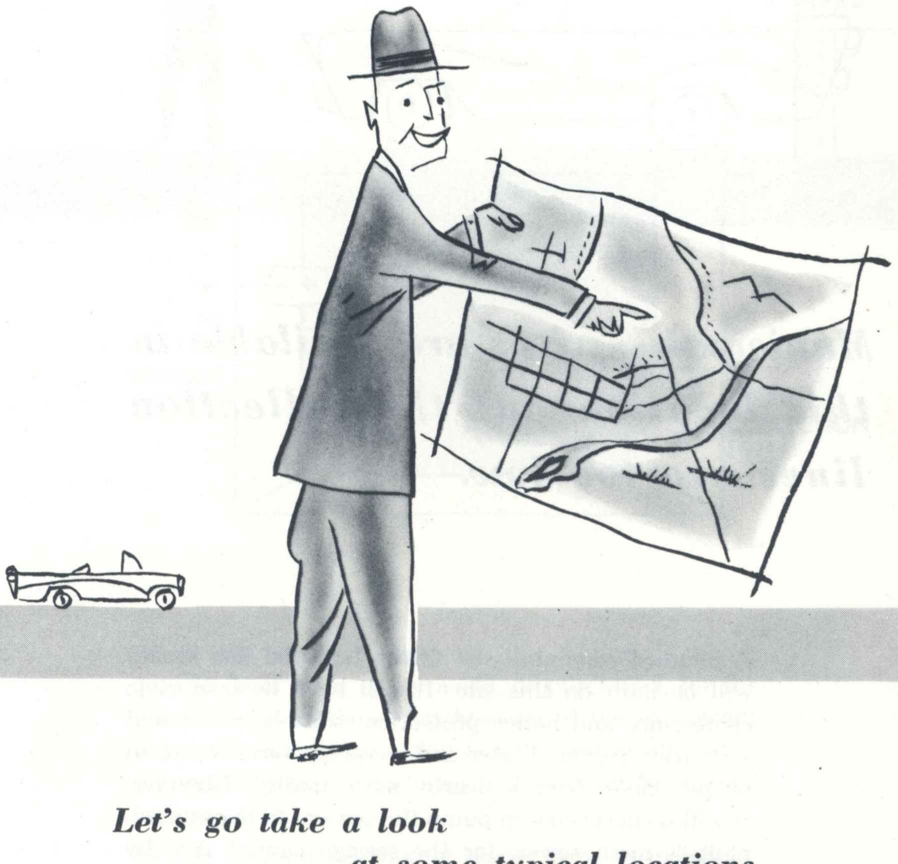
Small builders are also feeling a need for better sewage disposal facilities in individual homes. At one time the septic tank was standard equipment in areas where scattered homes were being built. In many cases, where the area has continued to expand, this led to a saturation of the soil. Unpleasant odors resulted and a health hazard was created. Modern home conveniences — automatic dishwashers and washing machines, garbage disposers — tend to interfere with the operation of the septic tank and have further complicated the problem.

Today's builders find that they must build fewer homes per development because they are restricted by the minimum lot size requirements of septic tank systems. The result is a greater cost per home on streets and all other utilities. *Fewer homes mean less profit.*

Effective sewage disposal is a matter of **LOCATION**

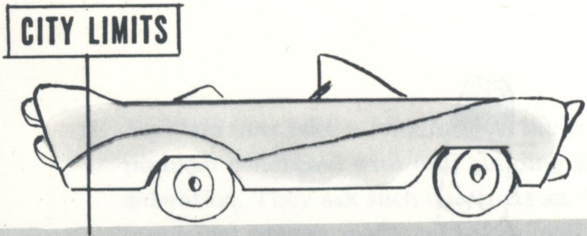
Builders now take a long look at the sewage disposal problem connected with any building site under consideration. They ask such questions as, "Can I tie into municipal sewage mains and if so, will my collection lines be lower than the mains . . . what is the history of septic tanks in the area and how do Health Authorities feel about them . . . will a sewage treatment plant need to be built to serve my homes . . . what kind of treatment plant will be necessary"?

The problem differs from location to location . . . and, so do the solutions to these problems. The purpose of this booklet is to highlight a few of the more typical problems facing today's Builders — and report on the ways Consulting Engineers have helped Builders solve these problems to the satisfaction of the Health Authorities responsible for enforcing our anti-pollution laws. Glossary of terms and brief description of equipment mentioned appears on pages 37 through 40.



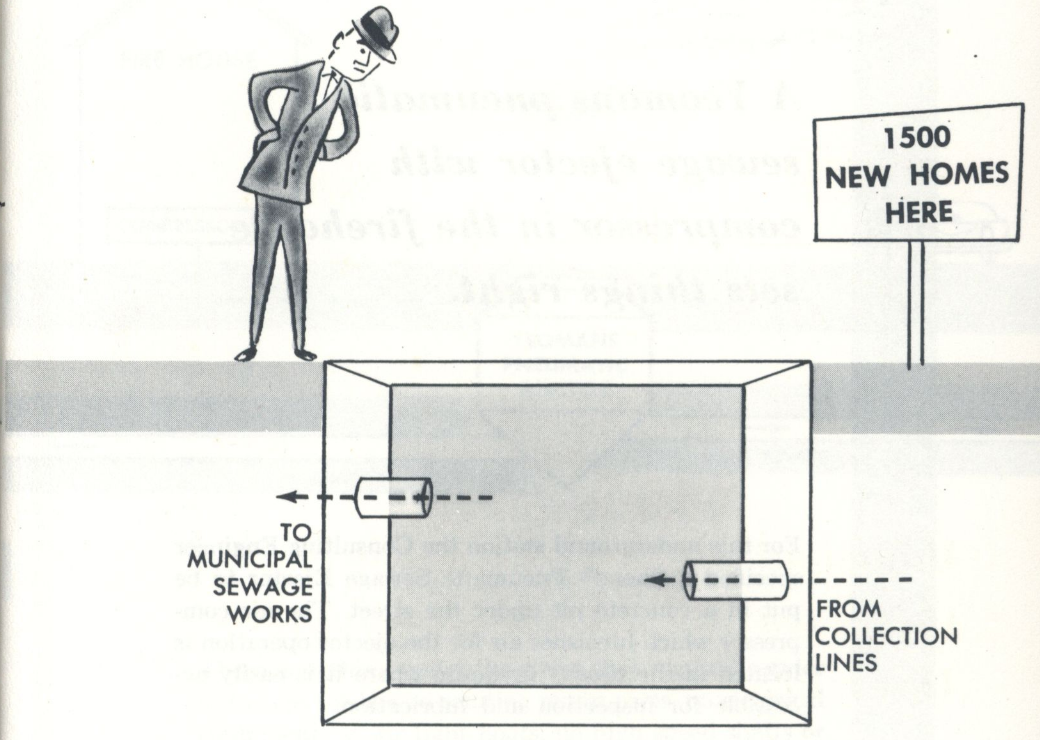
Let's go take a look

at some typical locations



Municipal services are available in this location but the collection lines are too low.

A planned community of fifteen hundred fine homes will be built on this site. It will have its own civic center, fire and police protection, schools, parks and recreation center. Water and sewerage services are to be purchased from a nearby municipality. However, it will be necessary to pump the sewage to the municipality's main sewer, for the sewage cannot flow by gravity. A "sewage lift station" must be built. What type shall it be? Will the structure which houses the pumping equipment be completely underground — or will the structure be above the ground?



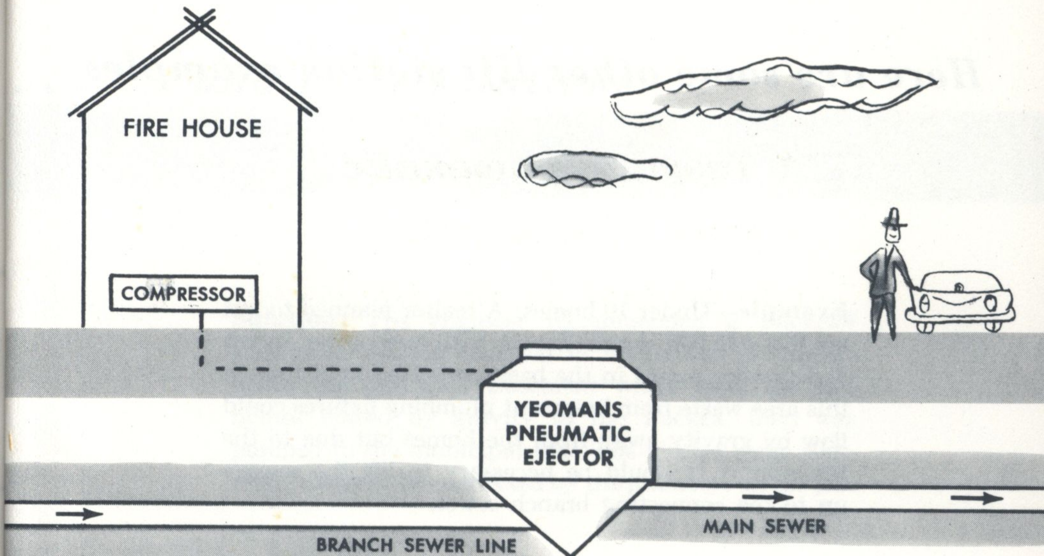
When the structure housing the station is above ground, land must be set aside, or purchased, for the pump house. If the entire housing of the equipment is below ground the station is described as an underground lift station—and may be located under streets, parkways, etc.

In this location the answer seems to be to install an underground station in the street in front of the firehouse. But will it get proper maintenance in this location — maintenance being a major consideration in selecting lift station equipment?

A Yeomans pneumatic sewage ejector with compressor in the firehouse sets things right.

For this underground station the Consulting Engineer specified a Shone® Pneumatic Sewage Ejector to be put in a concrete pit under the street. The air compressor which furnishes air for the ejector operation is located in the nearby firehouse where it is easily accessible for inspection and lubrication.

This type of equipment and remote location of the compressor solves the maintenance problem. This sewage ejector operates on a mechanical principle and is nearly fool proof — needs practically no maintenance.



There is nothing under the street that requires service as the ejector has no rotating pump parts, no electrical equipment, no air tight floats, no high speed shafts or bearings. Many Shone ejectors of this type have operated for thirty years or more without even a routine inspection.

Nor will there be any odor nuisance from this sewage lift station. The Shone Ejector itself is ideal for this job. It can't clog and is completely sanitary. And, being hermetically sealed, it is completely free of odor.

What will be the life of this pneumatic ejector? The life of a mechanically-controlled Shone Ejector is yet to be determined . . . the first ejector installed in 1889 in the United States-Auditorium, now Roosevelt College in Chicago—is still operating today.

Here are some other lift station examples

Example—Under 10 homes: A realtor planned to put up five $75,000 ranch homes with recreation rooms and powder rooms in the basement. He found that in this area waste from basement plumbing fixtures could flow by gravity away from the homes but due to the topography it would be necessary to lift the sewage up to the connecting branch sewer.

Example—Temporary service: The developer of a 50-home tract found that municipal sewerage lines would be extended to his area when adjacent open land also was subdivided. Until the lines were extended into the area it would be necessary for the builder to install his own temporary sewage lift station, the station to be abandoned when the municipality built a larger one to serve his and anticipated adjacent developments.

Example—Low installation costs: A land developer planning for 75 homes in an unincorporated area was told that although the cost of the sewage pumping station for the area must be assumed by him, the station must meet the codes of the adjoining villages. Location of the station required that it take a minimum of space, be odor-free and clog-proof, and be easy to install and maintain.

. . . *and their solutions*

Solution: His engineer recommended a Packex® pneumatic ejector installed in a concrete pit underneath the parkway. Basement waste from the five homes flowed by gravity to the Packex, then was pumped to the municipal line. The ejector came complete, ready to be connected by the plumbers on the job.

Solution: The consulting engineer drew up plans for a vertical suspended enclosed shaft centrifugal pump installed in a dry pit for this temporary installation. The equipment came in "package" form . . . ready for installation in the pit. When this temporary station is abandoned, the pump can be moved to a similar station. Cost of the complete station (construction and equipment) ran about $125.00 per home.

Solution: The engineers designed a pneumatic ejector pumping station using the "package" Expelsor® at an approximate cost of $120.00 per home. The "package" Expelsor is a complete, factory-assembled and wired, self-contained unit, with built in controls and ready-mounted air compressor. Like other package units, it's ready to set in place, connect, and put into operation.

more examples . . .

Example—Unusual ground conditions: A builder of 150 homes in a non-seweraged area had no room above ground for the sewage pumping station structure. Moreover, because of ground conditions, an underground station with concrete walls was not practical. A second consideration was the cost of equipping and installing the station.

• •

Example—Larger Sewage Flow: All sewage collection lines and laterals to the homes in a 1500 home subdivision led to a central collecting well. There the sewage from the entire area was pumped into the metropolitan sanitary district system. The structure housing the pumping equipment was camouflaged as a limestone gate house at the entrance to the golf course.

• •

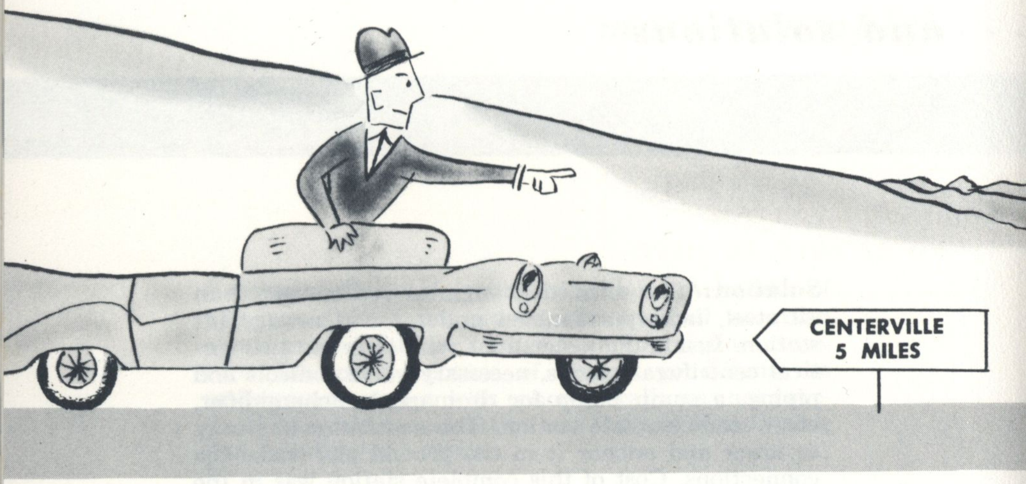
Example—When flooding could occur: A developer of a 1200 home-tract was able to foresee that the laterals and sewage collection lines from the entire area could be connected in to the sanitary district sewerage system. Since there was ample land, and the pumping station could be located in a non-residential area and the structure could be above ground, land was set aside in the original planning for the pump house.

and solutions

Solution: The consulting engineer recommended an all steel, factory-assembled underground sewage lift station. Inside the water-tight steel tank are two vertical centrifugal pumps, necessary valve controls and piping, a sump pump for drainage, a dehumidifier, etc. — the complete station. The contractor had only to lower and anchor it in the ground and make the connections. Cost of this complete station was in the neighborhood of $105.00 a home.

Solution: Consulting engineers for this builder chose horizontal non-clog centrifugal type sewage pumps for this lift station because they are easy to service and maintain. Capacity wise, vertical dry pit pumps could have served in the station since both types of units have the capacity and the desired sustained efficiency. Cost of this complete station is approximately $15.00 per home.

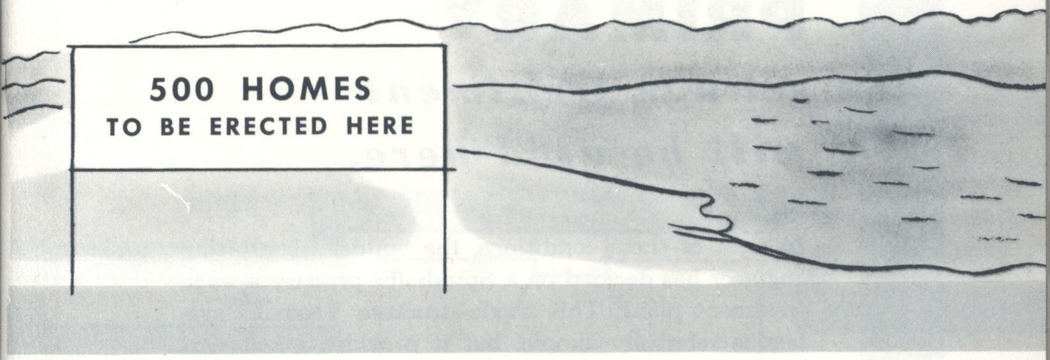
Solution: Consulting engineers recognized the possibility that there could be flooding of the station at this point in the land tract. For this reason, they recommended that vertical centrifugal dry pit pumps be installed. However, wanting no beam supports for intermediate bearings of the pumps, they specified that the pumping equipment be of the enclosed shaft dry pit type. Cost of the station and the pumping equipment ran about $13.00 per home.



Here's a building site not far from a large river.

It's a nice spot about five miles down the river from Centerville. The builder is planning to put up 500 homes. Because of hilly terrain, he cannot lay connecting lines to the Centerville sewage treatment plant —he will have to build his own.

Fortunately this land lies alongside a large river . . . a sizable rapidly flowing river which can take a fairly heavy waste load since there are neither recreational areas nor does any community take its water supply immediately down stream.



The State Board of Health required only primary treatment of the sewage — preliminary settling out of solids, and "digestion" of these settled solids to inoffensive compounds.

The builder notes that he does not have an isolated spot for this treatment plant — it will, of necessity, be close to some homes. Proximity to homes dictates that the sewage treatment facilities be inoffensive in every way to those residents whose property adjoins the plant. The Consulting Engineer's solution to this problem follows—see next page.

PRIMARY

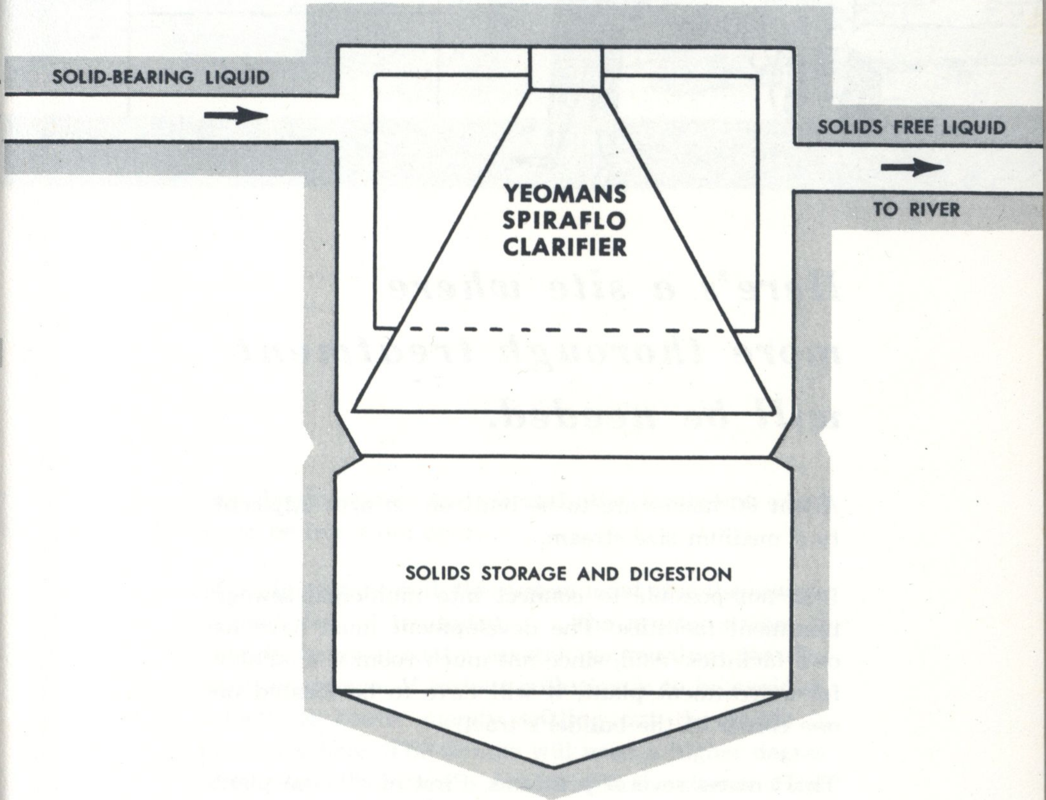
sewage treatment will be used here.

In light of these conditions, the builder's consulting engineer has decided on a Spirahoff® primary sewage treatment plant. This single-structure Yeomans system is relatively simple, but it provides a sufficient degree of treatment to meet the requirements of the State Board of Health in this case.

The plant receives raw sewage and retains it for a long enough period so that the solids and most of the suspended matter are settled out.

Solid matter drops into a storage chamber where biochemical action takes place . . . digesting the solids. During this period, the solid matter decomposes to the point where it is stable. The clarified water gradually spills over a weir and is carried off to the river.

The engineer has designed this single-structure plant so that it can be easily camouflaged and it will fit right into the neighborhood. The Yeomans equipment that will be used is quiet and efficient. Odors will never be a problem with this plant.

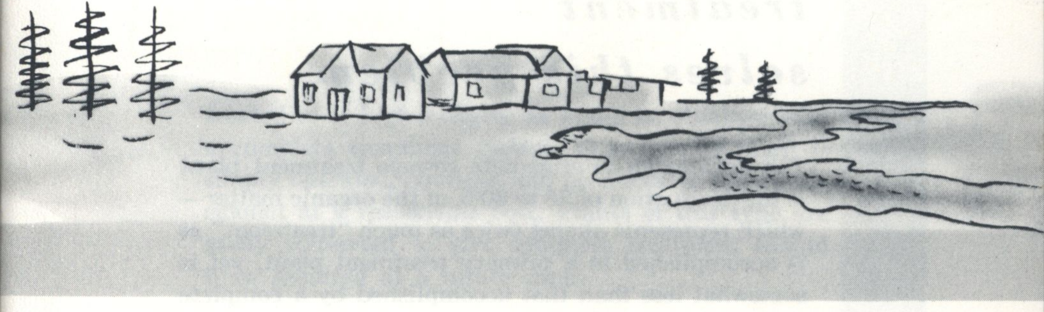

SOLID-BEARING LIQUID
YEOMANS SPIRAFLO CLARIFIER
SOLIDS FREE LIQUID
TO RIVER
SOLIDS STORAGE AND DIGESTION

Here's a site where more thorough treatment will be needed.

About 60 homes are to be built on an area adjacent to a medium size stream.

It is not possible to connect into municipal sewage treatment facilities. The development must have its own facilities. And, since not much room is available for a treatment plant, it will have to be located on one corner of the builder's tract.

This creates several problems. First of all, the plant must be small enough so that it can be camouflaged, otherwise it will conflict with the residential nature of



the development. And second, the treatment plant must be free from odor.

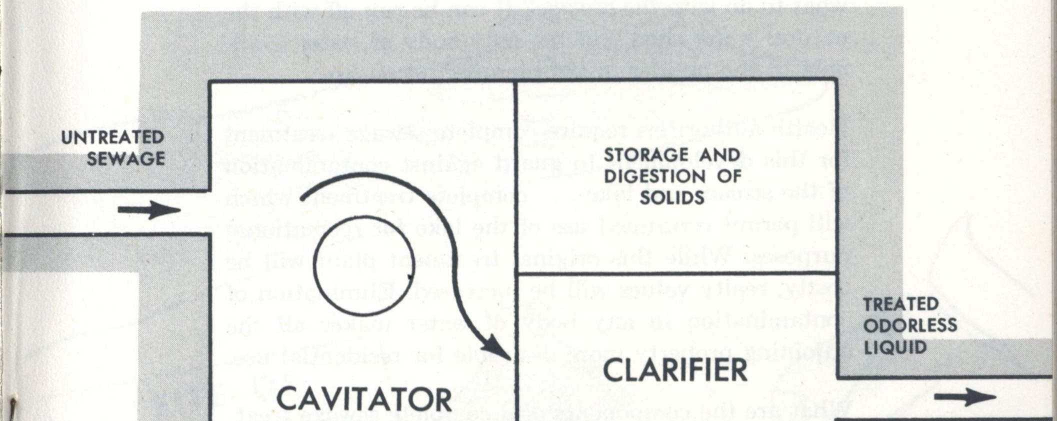
More important still, the system must give the sewage a good deal of treatment . . . the nearby stream is already being used by several communities for disposal of sewage. If serious pollution is to be avoided, something beside merely settling out the solids is necessary here. The sewage will need a higher degree of treatment before it is run off into the stream. How did the Engineer solve this builder's problem? See the following page.

INTERMEDIATE
treatment solves this problem

The goal in an intermediate sewage treatment plant is the destruction of 75 to 80% of the organic matter—which represents almost twice as much "treatment" as is accomplished in a primary treatment plant, yet is somewhat less than that accomplished by a complete treatment plant.

The destruction, or oxidation, of the organic matter is obtained by continuous aeration of the sewage for a period of 24 hours — sufficient air being supplied to satisfy the "combustion or digestion" process and to maintain cleansing velocities throughout the tank in which the sewage is aerated. Following the aeration process is a period of settling, or sedimentation. A third tank is used for storage of any surplus "sludge" which may develop in the settling tank as well as acting as a safety device in the event that it becomes necessary to shut off the aerating device for maintenance.

An intermediate treatment plant — commonly known as the aerobic digestion process — is not a "cure-all" for sewage treatment problems. Consulting engineers usually recommend it to builders of small subdivisions, schools, motels, trailer parks, etc., where the effluent from the treatment plant does not need to be treated to as high a degree as would be obtained with a complete treatment system. This type of plant is simply operated, odorless, and produces an acceptable effluent at a reasonable cost. Plants of this type are easily converted to give complete treatment should it be required at a future time.



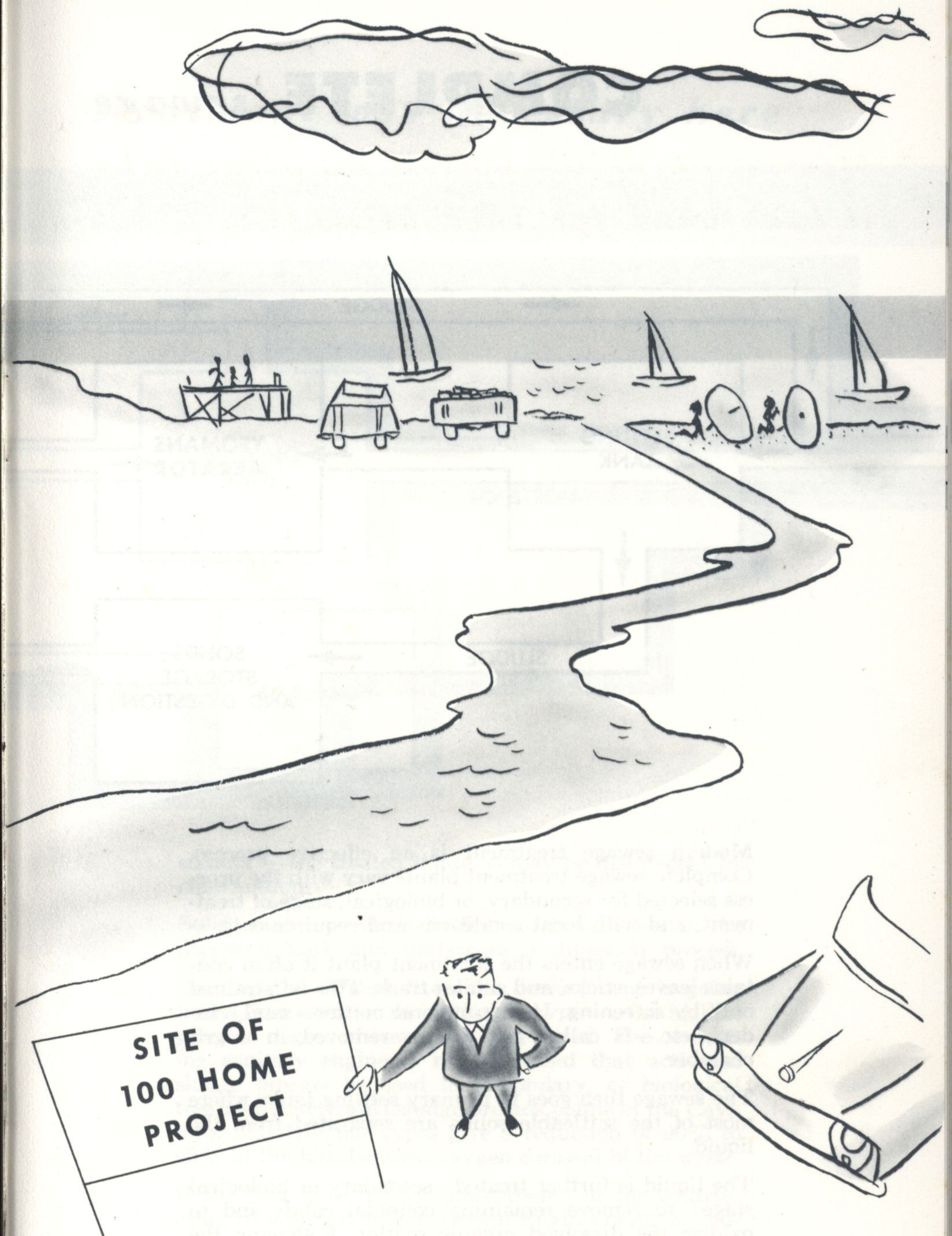
Here they're building on a small stream or ditch which empties into a lake used for recreation.

Here is a really fine location for a subdivision . . . right on a small stream which empties into a nearby lake. The lake is definitely an asset: boating, swimming, fishing, are near at hand. And the little stream gives character to the building site.

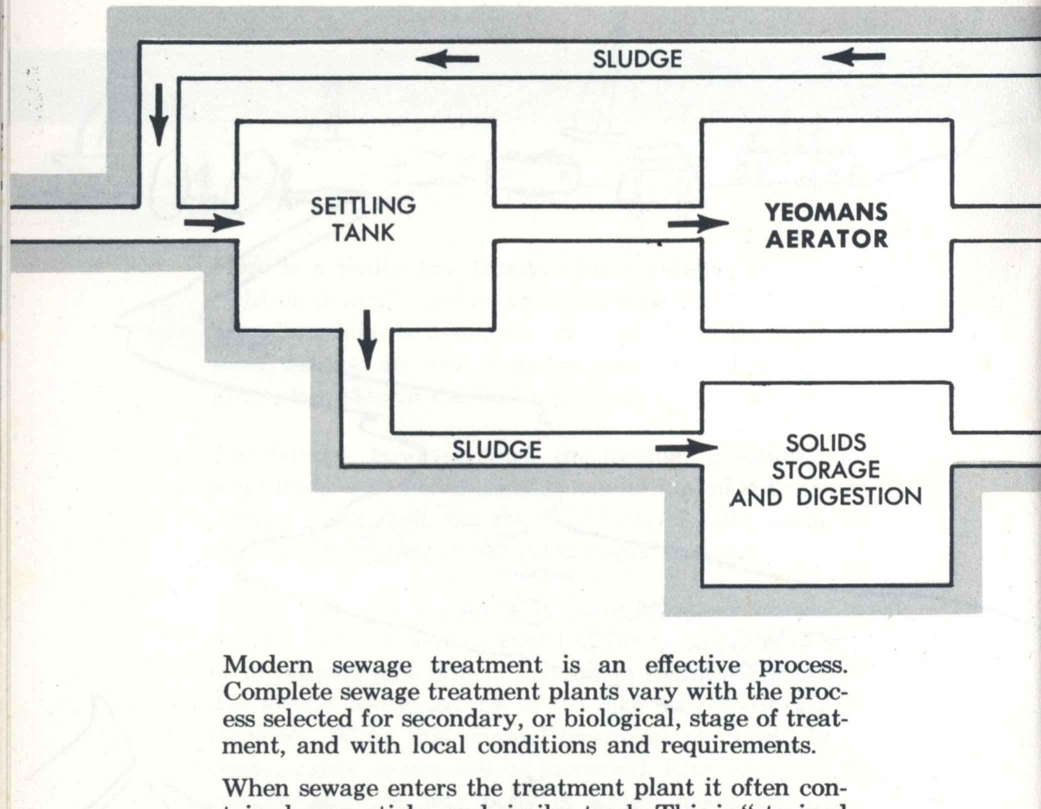
The builder, however, faces the familiar question — what to do with the sewage? It can be run off with the natural water shed, but the only body of water available to the builder is the picturesque stream.

Health authorities require complete sewage treatment for this development to guard against contamination of the stream and lake . . . complete treatment which will permit continued use of the lake for recreational purposes. While this original treatment plant will be costly, realty values will be increased. Elimination of contamination in any body of water makes all the adjoining property more desirable for residential use.

What are the components of a complete sewage treatment plant? Which type of secondary (biological oxidation) treatment did the Consulting Engineer specify? The answers are on the following pages.


SITE OF
100 HOME
PROJECT

COMPLETE *sewage*



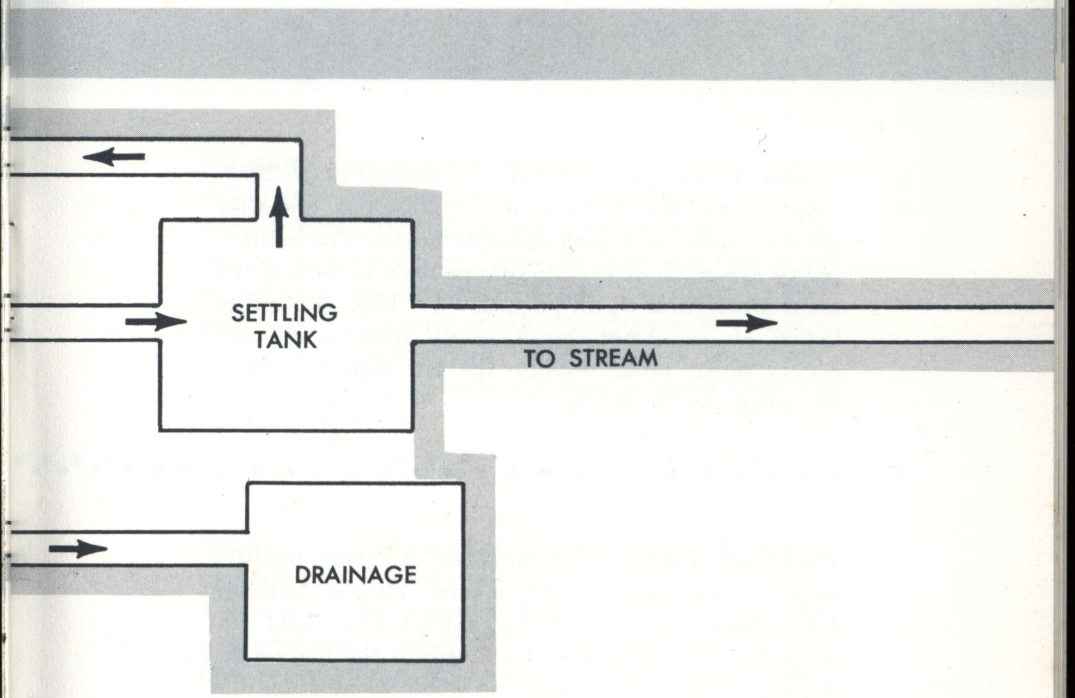
Modern sewage treatment is an effective process. Complete sewage treatment plants vary with the process selected for secondary, or biological, stage of treatment, and with local conditions and requirements.

When sewage enters the treatment plant it often contains leaves, sticks, and similar trash. This is "strained out" by screening. Heavy mineral matter—sand, cinders, etc.—is called grit and is removed in a grit chamber.

The sewage then goes to primary settling tanks where most of the settleable solids are separated from the liquid.

The liquid is further treated (secondary or biological stage) to remove remaining colloidal solids and to oxidize the dissolved organic matter. Following the oxidizing process, there is another period of settling—final settling—and the liquid then is ready for discharge into the stream or lake. Frequently the plant

treatment was necessary here



effluent — the treated liquid — may be disinfected by chlorination.

Solid matter which is settled out is removed to the digestion tank and undergoes a digestion process.

Because the effluent from the development is going into a lake used for recreational purposes, the highest possible degree of treatment is required. The consulting sanitary engineers recommended that activated sludge process be used for secondary, or biological treatment. Activated sludge process plants of the Cavitator and Hi-Cone types give a reduction of 90% to 95% in the bio-chemical oxygen demand of the waste.

If the lake were further downstream, or the contributing stream were larger, Health Engineers might consider the trickling filter process adequate for this complete treatment plant. Oxidation by standard rate trickling filter processes reduces the bio-chemical oxygen demand by 80% to 85%.

Some other situations where complete

Problem—Temporary Service: A builder of prefabricated homes planned to open 3 subdivisions, one after another, each containing about 40 homes. The municipality agreed to extend its sewage lines to each of the areas when, and if, an adequate tax base was established. He could not obtain county approval on temporary septic tanks because the lots were too small for adequate tile fields.

Problem—Planned Expansion: A home builder owned two adjacent tracts of land. He was building 500 homes on one tract, but intended to build 500 more homes on the other tract only if the market remained favorable. He knew he would need to build a complete sewage treatment system but did not know how large it should be.

Problem—Low Operating Cost: A home builder was putting up 600 homes on a 242-acre tract within sanitary district limits. He found that a complete sewage treatment system to serve his subdivision would be necessary. Because several bond issues had recently been defeated, the city was reluctant to attempt financing of the plant, but agreed to take over the operation, when the plant was built.

sewage treatment was necessary

Solution: His engineer designed a portable plant which gave complete treatment to the sewage from 40 homes. When the subdivisions were connected into the municipal sewerage lines, the plant was free to be moved to a new location. To date it has been moved twice and has served, in all, 120 homes. It includes Yeomans "Water-Wheel" trickling filter equipment and an Imhoff tank, both contained in metal tanks 12 feet in diameter.

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Solution: His consulting sanitary engineer recommended an activated sludge plant to serve 500 homes, which could be expanded to serve 1000 homes. His plan included a Spirahoff®, a Hi-Cone System, and a final settling tank. Space was reserved for additional units to be added, which would increase the capacity of the plant as required.

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Solution: $250,000 was raised from private investors to construct a Yeomans "Package" plant, which included a Spirahoff®, a trickling filter, and a Spiraflo Clarifier. When the city took over the operation of the plant, a small tax was added to the homeowner's water bill, partly to maintain the plant and partly to pay back the investors. The Yeomans plant has proven to be an excellent investment.

Problem—Minimum Power: A builder was putting up 750 homes near a ravine with a small stream flowing through it. Complete treatment of sewage was required before it could be run off into the stream. Power costs in the area were relatively high, but the builder wished to keep the homeowners' sewage charges to a minimum.

Problem—Planned Expansion: A builder of a planned community of 215 homes required a sewage treatment plant adequate for the homes, a school, a church, and a swimming pool. His building plans called first for the swimming pool, which was to serve as a local recreation point as well as a sales stimulus for the homes, half of which would go up the first year.

Problem—Easy Operation: A developer of an area suitable for 35 homes found that he must put in a sewage treatment plant which could be operated by only routine visits of the metropolitan sanitary district's regular personnel (he planned to turn the plant over to the sanitary district for operation upon completion). The area available dictated further that the plant be compact.

Solution: His consulting engineer designed a complete sewage treatment system, with gravity flow. It was located on sloping ground in the ravine. The plant consisted of a Spirahoff®, a trickling filter system employing a Yeomans High Capacity Distributor and a Spiraflo final settling tank . . . all gravity operated.

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Solution: The Consulting Engineer designed an intermediate sewage treatment plant using the Cavitator® . . . adequate for initial operation of the pool and the first group of homes. When the added homes, shopping center, school and church are completed this treatment plant will be expanded to a complete treatment system but the original structures and equipment will be incorporated into the expanded system.

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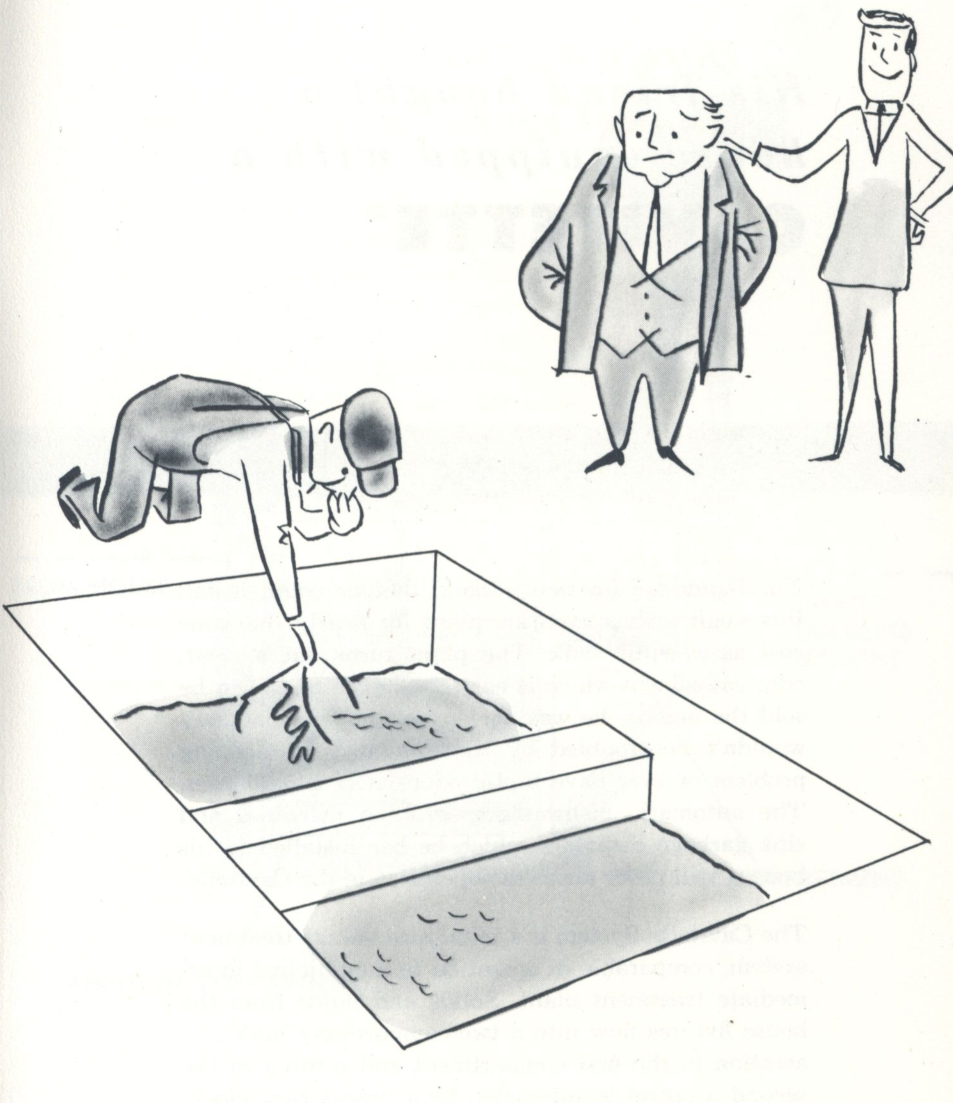
Solution: The need for easy operation and size of the development dictated the Engineer's specification of a trickling filter system using a "Water-Wheel" distributor. The unique feed control of a "Water-Wheel" insures positive, automatic operation at all sewage flows. To save space the primary settling tank and digester were built as a single structure, a Spirahoff® unit.

Here's a familiar scene: Annual septic tank cleaning

Notice the expression on the face of the man on the left? He is going through an annual experience called "septic tank cleaning time." The telltale rotten egg odor has told him that it was high time he had the tank cleaned. To top it all, he has just learned that he can't put in the new dishwasher that he had wanted. The run off would interfere with the operation of the tank. In fact, septic tanks in his area have been giving so much trouble that they have been banned for new homes by health authorities.

His friend on the right looks happy because his new home is equipped with a miniature sewage treatment plant. This plant frees him from all the worries connected with the septic tank . . . permits use of all modern home conveniences . . . is odor free. For more information on the CAVITETTE® System, see the following pages.

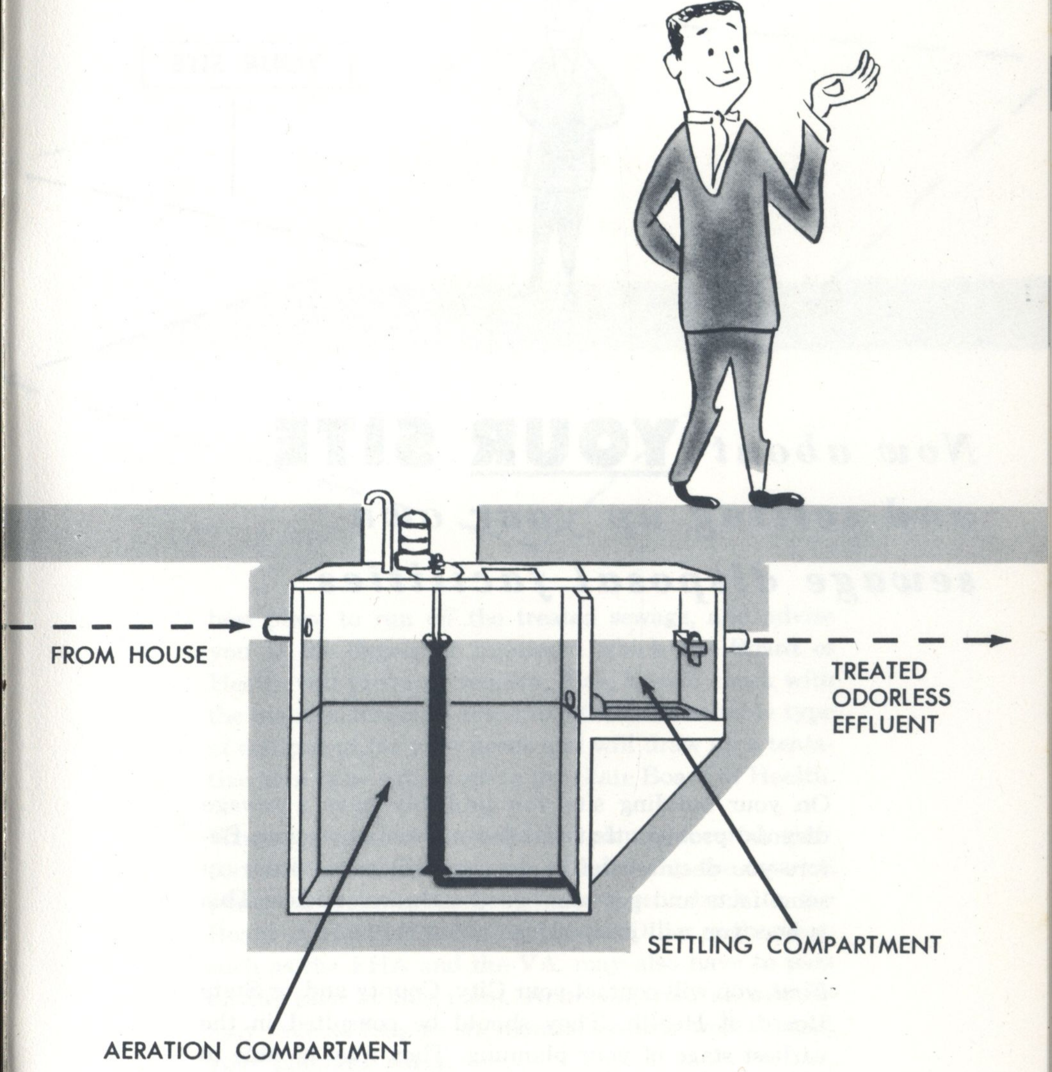


His friend bought a house equipped with a

CAVITETTE®

The builder of his house found that he could install this small sewage aeration plant for nearly the same cost as a septic tank. The plant turns out a clear, odorless effluent which is easy to dispose of. When he sold the houses, he was able to tell buyers that they wouldn't be troubled by the annual tank cleaning problem or ever have septic odors after a hard rain. The automatic dishwashers, washing machines and sink garbage disposals, which he has installed in his houses, will never affect the operation of the Cavitette.

The Cavitette System is a miniature sewage treatment system, comparable in operation to a municipal intermediate treatment plant. Solids and fluids from the house fixtures flow into a two-compartment tank . . . aeration in the first compartment and settling in the second. Control is automatic, by a pre-set time clock.


FROM HOUSE
TREATED
ODORLESS
EFFLUENT
SETTLING COMPARTMENT
AERATION COMPARTMENT

Now about **<u>YOUR</u> SITE** *and setting up your own sewage disposal facilities*

On your building site you probably have a sewage disposal problem that is different from any other. Before you decide what to do, you will need to dig up some facts and get some good technical advice. This is how you will probably go about it.

First, you will contact your City, County and/or State Board of Health. They should be consulted in the earliest stage of your planning. They may be able to give you some tips which, if followed, will make it easier to get approval later on. If you do not have a consulting sanitary engineer, they can send you a list of the engineers who are most active in your area.

Next, select your consulting engineer . . . he will get you started on the right track. He will tell you the best place to run off the treated sewage, and advise you of the degree of treatment which the Board of Health will probably require. Also, he will check with the manufacturers to determine the most suitable type of equipment for your needs and will draw up a tentative plan to be submitted to the State Board of Health.

When approval of the tentative plan is secured, your consulting sanitary engineer will draw up the detailed plans for your system, which are sent back to the Board of Health for final approval. Other authorities, such as the FHA and the VA, may also have to pass on the plan at this point. Approval from all sources may take as long as six months, so it is well to start your planning early.

If it is practical, your engineer will suggest that you buy all your equipment from one manufacturer. Sewage equipment is interdependent in character, and it is best to have the responsibility for the proper functioning of all the equipment rest on the shoulders of one manufacturer.

YEOMANS . . . *specialists in sewage equipment for* 60 YEARS

Since 1898 Yeomans has specialized in the design and manufacture of sewage handling equipment . . . has worked with Consulting Engineers in the application of this equipment to the special needs of their clients' job conditions. Hundreds of installations of all types of equipment and systems attest the acceptance of the Yeomans line by Federal, State, County and Local Health Authorities.

The Yeomans line of sewage pumping and treatment equipment is the most complete available. Both centrifugal pumps and pneumatic ejectors are available for sewage lift stations . . . and the stations can be either of the underground type or with a superstructure. All mechanical equipment for a sewage treatment plant is manufactured by Yeomans, for treatment by either the trickling filter or activated sludge process. A Yeomans recommendation focuses attention on the character of the job to be done in order to determine which type of equipment or system will perform most efficiently, dependably and at lowest cost.

When you are in the market for sewage equipment you want and welcome the counsel of a man who not merely knows equipment but who is trained to *understand the problem you expect the equipment to solve*. You'll find your local Yeomans representative just the man you're looking for. He operates, or is a member, of his own business. He handles several excellent lines of equipment to supplement his Yeomans line. He's a good business man, fully qualified to analyze a problem and to recommend a practical solution. You'll find him listed in the Classified Telephone Directory—a good man to know.

GLOSSARY of TERMS
and Yeomans Equipment

Activated Sludge—Sludge settled out of sewage previously agitated in the presence of abundant atmospheric oxygen, a portion of which is returned to the raw sewage as the active agent in accelerating biochemical purification.

Activated-Sludge Process—A treatment process in which sewage standing in or flowing through a tank is aerated along with activated sludge previously produced by the same process. The activated sludge is subsequently separated from the treated sewage (mixed liquor) by sedimentation.

Aeration—Any process or method of bringing about intimate contact between air and a liquid.

Aerobic Bacteria—Those which require and utilize oxygen for their existence.

Aerobic Digestion—The theoretical destruction of all organic matter applied by means of greatly increased or "super" aeration. B.O.D. removals are obtained by continuous aeration for a period of 24 hours with the application of sufficient air supply to satisfy the "combustion or digestion" process and to maintain cleansing velocities throughout the aeration tank. The aeration process is followed by a period of sedimentation in a tank of sufficient volume to provide ample time for subsidence of the finely divided sludge particles. See Intermediate Treatment.

Biological Filtration—The process of passing a liquid through a bed of sand, gravel or broken stone, or media on the surface of which zoogleal films have developed which absorb and adsorb fine suspended, colloidal and dissolved solids and release end-products of biochemical action.

Biochemical Oxygen Demand—Usually abbreviated B.O.D. A measure of the quantity of oxygen required for the biochemical oxidation of sewage or other polluted liquid. (Usually incubated for 5 days at 20°. A demand may be exerted for 20 days or more).

Branch Sewer—A sewer which receives sewage from a relatively small area and discharges into a main sewer.

Cavitator®—An aerator marketed by Yeomans for aeration of sewage. The equipment may be used in either the Activated Sludge Process or in Aerobic Digestion.

Cavitette®—A miniature sewage treatment system for single homes which operates where septic tank systems can't. This system is exclusive with Yeomans—functions like an Aerobic Digestion system.

Centrifugal Pump—A pump consisting of an impeller fixed on a rotating shaft, enclosed in a casing, and having an inlet and a discharge connection. The rotating impeller creates pressure in a liquid by the velocity derived from centrifugal force.

Clarifier—See Sedimentation Tank.

Colloidal Solids—Extremely finely divided suspended material which will not settle and cannot be removed by the usual laboratory filtering.

Complete Treatment System—A sewage treatment system consisting of all structures and equipment for screening, primary settling, oxidizing of sewage, final settling, digestion and pumping as may be required. Oxidizing of sewage may be accomplished by either the Activated Sludge Process or Biological Filtration.

Contamination—The introduction into water, otherwise fit for human consumption, of bacteria, sewage, or other substances, which render the water unfit or undesirable for human consumption.

Degree of Purification—A measure of the removal and oxidation effected by treatment processes with references to solids, organic matter, bacteria, or any other specified substance.

Digestion—The biochemical decomposition of organic matter resulting in the formation of gases, mineral and simpler organic compounds.

Distributor—A device used to apply sewage to the surface of a filter, consisting of rotating discs or rotating, reciprocating or traveling perforated pipes or troughs applying a spray or a thin sheet of sewage.

Effluent—Partly or completely treated sewage, discharging from any sewage treatment device.

Ejector—See Pneumatic Ejector.

Expelsor® Pneumatic Ejector—A relatively low-cost electrode controlled unit (see Pneumatic Ejector) for small to medium flow sewage lift stations (30 to 600 g.p.m.).

Filtration—The process of passing a liquid through sand, broken stone or gravel to remove suspended and colloidal matter and oxidize dissolved organic matter. See Biological Filtration.

Final Settling Tank—A tank through which the effluent from a trickling filter or aeration tank flows for the purpose of removing the settleable solids.

Gravity System—A system in which all sewage runs on descending gradients from source to outlet, and where no pumping is required.

Grit—The heavy mineral matter in sewage, such as sand, gravel, cinder, etc.

Grit Chamber—A small detention chamber or an enlargement of a sewer designed to reduce the velocity of flow of the liquid to permit the separation of mineral from organic solids.

High-Rate Trickling Filter—A trickling filter operated at a rate high enough to discourage clogging, usually between 10 to 30 m.g.d. per acre. Sometimes called high-capacity filter.

Hi-Cone®—An aerator marketed by Yeomans for surface aeration of sewage. The equipment is used in the Activated Sludge Process.

Imhoff Tank—A deep two-storied tank invented by Karl Imhoff, M. Am. Soc. C.E., consisting of an upper or continuous flow sedimentation chamber and a lower or sludge digestion chamber. The floor of the upper chamber slopes steeply to trapped slots, through which solids may settle into the lower chamber. The lower chamber receives no fresh sewage directly, but is provided with gas vents and with means for drawing digested sludge from near the bottom.

Influent—Sewage, raw or partly treated, flowing into any sewage-treatment device.

Intercepting Sewer—A sewer which receives the dry-weather flow from a number of transverse sewers or outlets, frequently with the addition of a determined quantity of storm water if from a combined system and conducts it to a point for treatment or disposal.

Intermediate Treatment—Any process of treating sewage or industrial wastes which removes a high per cent of suspended solids and a substantial per cent of colloidal matter, but little dissolved matter.

Lateral Sewer—A sewer which discharges into a branch or other sewer and has no other common sewer tributary to it.

Liquid Sludge—Sludge containing sufficient water (ordinarily above 80 per cent) to permit flow by gravity.

Main Sewer—A sewer which receives one or more branch sewers as tributaries.

Mixed Liquor—The mixture of activated sludge and sewage in the aeration tank undergoing activated sludge treatment.

Non-Settleable Solids—Solids so finely divided that they will not settle from sewage within a period of several hours.

Outfall Sewer—A sewer which receives the sewage from a collecting system or treatment works and conducts it to a point of final discharge.

Oxidized Sewage—Sewage in which the organic matter has been combined with oxygen and stabilized.

Oxygen Demand—The demand of sewage for oxygen. Commonly measured by the Bio-Chemical Oxygen Demand Test designated as B.O.D.

Packex® Pneumatic Ejector—A factory-assembled, self-contained unit (see Pneumatic Ejector) with air compressor, sewage receiver, controls, connections, etc. ready for on-site connections. Maximum capacity is 20 g.p.m., maximum discharge head 20 ft.

Pneumatic Ejector—A device for raising sewage, or other liquid, by alternately admitting it through a check-valve into the bottom of an airtight pot and then ejecting it through another check-valve into the discharge pipe by admitting compressed air to the pot above the liquid.

Primary Tank—Settling tank used ahead of subsequent treatment process. Treatment accomplished is preliminary settling or primary sedimentation.

Primary Treatment—The removal of a high percentage of settleable organic matter but little colloidal and dissolved matter.

Relative Stability—The ratio, expressed in percentage of available oxygen in waste waters, sewage, effluent, or diluted sewage to that required to provide complete biochemical oxidation of the organic matters contained therein.

Return Sludge—Settled activated sludge returned to mix with incoming raw sewage.

Secondary Settling Tank—See Final Settling Tank.

Sedimentation Tank—A tank or basin in which a liquid is retained long enough with a velocity of flow low enough, to remove by subsidence or gravity a part of the suspended matter. Usually the detention period is short enough to avoid anaerobic decomposition.

Separate Sludge Digestion—The digestion of sludge in basins or tanks to which it is removed from the basins or tanks in which it originally settled.

Septic Sewage—Sewage undergoing putrefaction in the absence of oxygen.

Septic Tank—A single-story settling tank in which the sludge is in immediate contact with the sewage flowing through the tank, and in which the organic solids are decomposed by anaerobic bacterial action.

Setteable Solids—Suspended solids which will subside in quiescent sewage in a reasonable period. (Two hours is a common arbitrary period.)

Settled Sewage—Sewage from which some of the solids have settled out in a tank during quiescence or slow flow.

Sewage—Wash water, culinary waste and liquid waste containing human excreta and other matter, flowing in or from a house drainage system or sewer. Liquid wastes from institutions, business buildings and liquid wastes from industries with such ground, surface, and storm water as may be admitted to or find its way into the sewers.

Sewage Treatment—Any artificial process to which sewage is subjected in order to remove or so alter its objectionable constituents as to render it less offensive or dangerous.

Sewage Rental—A specific charge made for sewer service as distinct from ad valorem taxes.

Sewerage System—A collecting system of sewers and appurtenances.

Sewage Works—A comprehensive term, including all construction for the collection, transportation, pumping, treatment, and final disposition of sewage.

Sludge—The accumulated suspended solids of sewage deposited in tanks or basins, containing more or less water to form a semi-liquid mass.

Shone® Pneumatic Ejector—The original equipment of this kind (see Pneumatic Ejector), named for the inventor, Sir Isaac Shone who designed the equipment in 1870 for the Houses of Parliament, London, England.

Sludge Digestion—The biochemical process by which organic or volatile matter in sludge is gasified, liquefied, mineralized, or converted into more stable organic matter, thus reducing the volatile content about 50 per cent.

Spiraflo*—See Sedimentation Tank, Primary Tank, and Final Tank. Patented features result in higher removals of suspended solids and B.O.D. than is generally accomplished with conventional clarifiers.

Spirahoff® (Spiragester)—A single structure serving the dual purpose of preliminary settling (see Primary Tank) and digestion of solids. Unit can be used as a Primary Treatment system or in a Complete Treatment system.

Storm Sewer—A sewer which carries storm and surface water, street wash, and other wash waters, or drainage, but excludes sewage.

Surface Aeration—The absorption of air through the surface of a liquid.

Suspended Matter—(1) Solids in suspension in sewage or effluent. (2) Commonly used for solids in suspension in sewage or effluent which can be readily removed by filtering in a laboratory.

Trickling Filter—An artificial bed of coarse material such as broken stone, gravel, clinkers, slate, slats, or brush, over which sewage is distributed and applied in drops, films, or spray from troughs or drippers, moving distributors, or fixed nozzles, and through which it trickles to the under-drains, giving opportunity for organic matter to be oxidized by bio-chemical agencies.

Water-Wheel*—A distributor for Biological Filtration. Unit, a Yeomans exclusive, is used for the small trickling filter type sewage treatment plant. Positive continuous distribution at all flows is assured by the water wheel type of feed control.

*A Yeomans Trade Mark

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